

January 13, 2012

Project No. 04-01-101-001

Mr. William Knight, P.E.  
Supervisor  
Special Projects Branch  
Bureau of Corrective Actions  
Nevada Division of Environmental Protection  
2030 East Flamingo Road, Suite 230  
Las Vegas, Nevada 89119

Re: Titanium Metals Corporation  
Henderson, Nevada Facility  
NDEP Facility ID # 000537  
*Semiannual Groundwater Monitoring Report – 1<sup>st</sup> Semester, 2011, Response to NDEP  
Comments*

Dear Mr. Knight:

Please find attached a copy of Titanium Metals Corporation's (TIMET's) response to NDEP's comments in their December 21, 2011 correspondence regarding the Semiannual Groundwater Monitoring Report for the 1<sup>st</sup> Semester of 2011 for data associated with the TIMET facility. The attached report was authored by Ms. Victoria Tyson-Bloyd of Tyson Contracting and Mr. Craig Wilkinson of TIMET and has been approved by me.

If you have any questions regarding this submittal, please do not hesitate to contact me at (702) 563-0600.

Sincerely,  
BROADBENT & ASSOCIATES, INC.



Kirk J. Stowers, EM-1549 (exp. 10/11/12)  
Associate Geologist

*JURAT: I, Kirk J. Stowers, hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state and local statutes, regulations and ordinances.*

cc: Craig Wilkinson – TIMET, hard copy and by electronic mail  
Victoria Tyson-Bloyd – Tyson Contracting, Inc., hard copy and by electronic mail  
Shannon Harbour, Nevada Division of Environmental Protection, Carson City, Nevada,  
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BMI Compliance Coordinator, Nevada Division of Environmental Protection, Las Vegas,  
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Ranajit Sahu – BRC, by electronic mail  
Ed Modiano – de maximis, by electronic mail  
Joe Kelly – Montrose, by electronic mail  
Paul Sundberg – representing Montrose, by electronic mail  
Lynne Preslo – representing Montrose, by electronic mail  
Brian Waggle – representing Montrose, by electronic mail  
Curt Richards – Olin, by electronic mail  
Lee Erickson – Stauffer, by electronic mail  
Nick Pogoncheff – representing Stauffer, by electronic mail  
George Crouse – representing Syngenta, by electronic mail  
Jay Steinberg – bankruptcy trustee, by electronic mail  
Allan DeLorme – ENVIRON International Corp, by electronic mail  
Mark Travers - ENVIRON International Corp, by electronic mail  
Jeff Gibson – AMPAC, by electronic mail

## Attachment A

1. General comment, as discussed with TIMET previously, NDEP is completing an evaluation of regional groundwater conditions and the various monitoring programs in the region. This evaluation may supersede or supplement the comments contained herein. No response to this comment is necessary.

**TIMET Response:** No response to this comment is necessary.

2. Section 1.0, page 1-1, TIMET notes that the permit compliance monitoring information is not presented in this report. This information may provide valuable insight in to site conditions and or fate and transport mechanisms. It is requested that this information be discussed and utilized in the development of future iterations of this Deliverable. NDEP believes that this directly pertains to the purpose of the Deliverable as discussed in Section 1.2 as follows “(3) evaluate relationships between groundwater chemistry, hydrogeology and potential sources.”

**TIMET Response:** To clarify data obtained for both the groundwater protection and landfill permits are reported and assessed as part of the groundwater report. For example, the J2 landfill permit requires analysis of general chemistry, metals (chromium, magnesium, and vanadium), total dissolved solids, and chloride at wells J2U2, J2D1-R2, and J2D2-R2. These data are evaluated and reported as part of this submittal. For completeness, the text in Section 1.0 is documenting data objectives for each groundwater monitoring well. However, the stated usage of the data is confusing. Future deliverables will revise this section for clarity.

3. Section 2.2, page 2-2, regarding field parameters, NDEP provides the following comments:
  - a. Please discuss if the dissolved oxygen meter was calibrated and if so, what standard operating procedure (SOP) was followed. NDEP has noted that these values appear to vary wildly across the BMI Complex and Common Areas and in some cases do not make logical sense.

**TIMET Response:** TIMET utilizes QED’s MP20 and YSI’s 556 MPS probes for groundwater monitoring events. Both meters are calibrated in accordance with manufacturer’s guidelines for each parameter monitored, including dissolved oxygen. The calibration guidelines for each meter are attached. For the MP20, it should be noted that the DO %Saturation Calibration Standard (Saturated-Air Method) is followed. Per manufacturer’s recommendation, the “Known Concentration Method” is not conducted. However, the field team checks the meter against a 0 mg/L standard.



- b. In future iterations of this Deliverable, please include a figure which presents the field parameters. NDEP has found that a qualitative review of these parameters can provide insight in to fate and transport mechanisms.

**TIMET Response:** In future deliverables a table will be provided that presents the field parameters.

- c. In future iterations of this Deliverable, please include the groundwater sampling forms as an Appendix.

**TIMET Response:** In future deliverables the groundwater sampling data forms will be provided as an Appendix.

4. Section 3.0, page 3-2, please clarify if the Figures in Appendix E utilize current or 2009 TIMET data.

**TIMET Response:** The TIMET data presented on the figures in Appendix E is from the 2<sup>nd</sup> semester 2009 dataset which, when combined with the Phase B groundwater dataset from Tronox, are temporally similar (late 2009).

5. Section 3.2.1, page 3-5, the NDEP notes that the assertion that TDS impacted groundwater from the NERT site is migrating onto the TIMET site is not supported by Figure 3-1.

**TIMET Response:** It should be noted that Figure 3-1 (the potentiometric surface map) is not referenced by TIMET as supporting documentation of encroachment from sources west of TIMET's Plant Site. Depiction of groundwater gradient maps is highly sensitive to the spatial density between monitoring points which is why TIMET supports NDEP's development of a regional groundwater database and coincident sampling events among companies. In addition, current groundwater gradients are not reflective of historic groundwater gradients before active remediation on Tronox's behalf (i.e., groundwater extraction, hydraulic containment via slurry wall, groundwater injection). All these factors affect Figure 3-1, and TIMET does not consider Figure 3-1 to reflect the historical migration pathways for NERT Site Related Chemicals (SRC). For example, impacts of hexavalent chromium and perchlorate are pervasive on the northern portion of the Plant Site, and are known to be principally, if not entirely, sourced at the NERT site. The presence of perchlorate in and of itself confirms the encroachment.



Notwithstanding the known historical impacts, TIMET also maintains its assertion that impacted groundwater from the former Tronox facility continues to migrate onto the TIMET property. The chromium isoconcentration map (Figure D-2) clearly depicts the trajectory of impacted groundwater beneath TIMET. In addition, TDS reported by Tronox in their groundwater annual reports repeatedly depict encroachment by TDS impacted groundwater minimally at 5,000 ppm.

This matter is settled from an allocation perspective, and TIMET sees no gain in further developing the basis for this assertion. It is NERT's responsibility to cease any and all encroachment. It is not TIMET's responsibility to technically develop the level of encroachment. Suffice to say, it is TIMET's position that any and everywhere perchlorate occurs on the Plant Site, the potential exists that other NERT SRC may or may not accompany it. Accordingly, the encroachment of perchlorate unequivocally opens the possibility that all SRC or any portion thereof at a given monitoring point where perchlorate occurs may be attributable to NERT.

6. Section 3.2.1, page 3-6, TIMET notes that some wells were not evaluated for cation anion balance (CAB) because one or more analytes was rejected. A review of the data indicates that certain analyses were incomplete and that no data was rejected. It is noted that depending on the analyte the CAB may still be useful. It is requested that TIMET re-evaluate these wells and determine if the data is still usable. Alternately, NDEP can complete this evaluation.

**TIMET Response:** The report text stated the wells were not evaluated because either they were not scheduled for sampling/analysis OR one or more analytes were rejected. NDEP is correct in that wells CMT-101, M-129, M-130, TMPZ-106, TMPZ-108, and TMPZ-109 CAB analysis was not performed due to insufficient data, not rejected data. Since no data were rejected in validation, all available data are usable for evaluation, however, TIMET asserts that qualification of data based upon CAB analysis resulting from an incomplete dataset would be inaccurate.

7. Section 3.2.2, page 3-7, TIMET notes that metals were evaluated versus USEPA MCLs or Secondary MCLs and some metals were evaluated versus BCLs. The NDEP notes that MCLs and BCLs are based on a target risk of 1E-06 and hence, MCLs do not represent a greater risk than BCLs. Please note the number of wells exceeding the respecting comparison levels and clarify how this pertains to the evaluation of other analytes as well.



**TIMET Response:** For brevity, the author selected analytes which “generally represent greater risk” for discussion within Section 3.2.2 and when combined with review of Appendix D figures portray a detailed summary of groundwater conditions. As the text states, only one well within the dataset exceeded the respective screening criteria for molybdenum, lithium, aluminum, vanadium, and iron. For arsenic, 17 of the 17 Plant Site wells sampled exceeded its screening criteria as depicted on Figure D-1. For chromium, six of the 18 Plant Site wells sampled exceeded the screening criteria as depicted on Figure D-2. For uranium, 13 of the 23 Plant site wells sampled exceeded its screening criteria as depicted on Figure D-12. For manganese, three of the 17 Plant Site wells sampled exceeded the screening criteria as depicted on Figure D-4.

It is unclear what the NDEP’s request “...clarify how this pertains to the evaluation of other analytes as well,” means within this context. TIMET has provided NDEP groundwater monitoring reports for the past 11 years with various modifications to the scope and format in concert with NDEP. The presentation of analytes contained with Appendix C (trend graphs) and Appendix D (isoconcentration contours) represent principal “chemicals of concern” or “known site conditions.”

In response to NDEP’s last set of review comments, TIMET expanded this section to include a discussion of select analytes, albeit stopping short of converting the groundwater monitoring report into a Nature and Extent / Remedial Investigation document. It should be noted, that TIMET has met its obligation under the Consent Agreement to investigate and evaluate groundwater in the shallow water bearing zone which is formalized in the Record of Decision. It should also be noted that the implementation of the groundwater remedy has been delayed by the investigation and remediation of the BMI Common Areas on TIMET property (Beta/ Northwestern Ditches). TIMET has met with NDEP on previous occasion and agreed that continued groundwater monitoring is warranted in the period between groundwater remedy selection and implementation. However, the objective of such investigation is to monitor existing conditions until the remedy is constructed at which time, the objective of the groundwater monitoring will be modified to evaluate and confirm system performance.

TIMET suggests a meeting with NDEP to clarify NDEP’s comments and understand the extent of continued expansion of the scope of the groundwater monitoring report.

8. Section 3.2.2, page 7, regarding Figure E-1 and the remaining Figures in Appendix E, NDEP does not necessarily concur with TIMET’s characterizations regarding off-site sources as they do not appear to be supported by the available data or the groundwater gradient (note Figure 3-1). We request that TIMET delete that shading depicting the “Upgradient Encroachment Corridor” from Appendix E figures and reissue these figures as part of the response to comments.



Please note that this matter will be addressed in the evaluation of regional groundwater conditions and should be addressed in future Deliverables from TIMET

**TIMET Response:** At NDEP's behest, TIMET submitted Appendix E figures as a snap-shot of groundwater conditions with a combined dataset (late 2009). TIMET respectfully declines to delete the shading depicting the "Upgradient Encroachment Corridor" as a resubmittal. The "corridor" is conceptual and thus subjective in nature and represents TIMET's interpretation of historical and current conditions. As previously discussed, the TIMET property has and is being impacted by solute transport via groundwater from facilities west of its property boundary. It should be noted, Figure 3-1 does not represent historical groundwater gradients and there is a large archive of analytical data to document encroachment onto TIMET property from source areas located west of the facility. It should also be noted that the administrative record very clearly documents NDEP's concern regarding the inability of Tronox's current groundwater remediation system (barrier wall and extraction wells) to adequately contain groundwater impacted from encroaching onto TIMET.

TIMET anticipates further discussion regarding this issue with NDEP during negotiation of the Phase III Administrative Order on Consent. As stated previously, the discussion and resolution of this issue is beyond the scope of a groundwater monitoring report

9. Section 3.2.4, page 3-9, please provide the basis for stating that the VOC plume is stable.

**TIMET Response:** If the mass loading of solute exceeds the assimilative capacity of the aquifer, then the plume is unstable and expanding. TIMET has mapped the PCE contour dating back to the 2<sup>nd</sup> quarter of 2006 as depicted in Figures 3 through 8 in the Groundwater Remedial Action Operation and Maintenance Monitoring Sampling and Analysis Plan, dated February 22, 2010. Subsequent mapping of the PCE has been presented in each semi-annual groundwater monitoring report since the beginning of 2010 through this submittal. These figures represent over five years of plume monitoring which demonstrate the PCE contour is not expanding.

10. Section 3.2.4, page 3-9, NDEP provides the following comments:
- 1<sup>st</sup> bullet, regarding wells MW-3 and MW-3R, please clarify the screened intervals in each of the wells to insure that the data comparisons are meaningful.
  - NDEP could not locate wells AA-15 or -19 on Figure D-9; please clarify.

**TIMET Response:**

- (a) Former monitoring well MW-3 was screened 37 to 67 feet below ground surface where as MW-3R is screened 41 to 66 feet below ground surface.
- (b) Monitoring wells AA-15 and AA-19 were reported as “insufficient water column to collect sample” and “dry” on Table 2-1. Therefore, they were not sampled and not shown on Appendix D figures.

11. Appendix D, NDEP provides the following comments:

- a. General comment, some of the Figures in this Appendix and Appendix E were of very poor copy quality. Please check this prior to submittal of future Deliverables.
- b. General comment, please label all wells that were not sampled.

**TIMET Response:** Future deliverables will comply with NDEP requested actions.

12. Appendix E, NDEP provides the following comments:

- a. General comment, please show the well IDs on these figures in future Deliverables.
- b. General comment, please show the USEPA MCL or NDEP BCL on each Figure as appropriate to provide context.
- c. Figure E-1, TIMET should examine the screened intervals of the wells mapped on each of these Figures to verify that the correct water-bearing zone is being presented.
- d. Please explain how wells were determined to be “representative” in terms of TIMET and NERT.
- e. Please note and comply with Item # 8 above.



**TIMET Response:**

- (a) Future deliverables will show the well IDs when mapping groundwater data.
- (b) Future deliverables will show the applicable screening level when mapping groundwater data.
- (c) Using available groundwater databases at the time these figures were prepared, TIMET confirmed the wells depicted are screened within the shallow water bearing zone.
- (d) Representative upgradient concentrations for select SRC were established by averaging the highest three concentrations within the principal corridor of off-site impacts on the Plant Site. This principal corridor is based on (1) historic gradients prior to Tronox groundwater containment system; (2) current gradients showing component onto Plant Site; and (3) "foot-print" of perchlorate and hexavalent chromium impacts to Plant Site groundwater indicating historic flow paths. The average of the three highest concentrations within this corridor is considered what might reasonably impact Plant Site groundwater at a point along the western and southern property boundaries. Therefore, this represents a potential sample result at a hypothetical monitoring well located at the point of encroachment.
- (e) See response to Item #8 above

## CALIBRATION

### 3.4.3 Temperature

#### Cleaning and Preparation

- Soap or rubbing alcohol may be used to remove grease, oil, or biological material.
- Rinse with water.

#### Calibration Standard

- Factory-set and no recalibration required.

### 3.4.4 Specific Conductance, Salinity, and TDS

#### Cleaning and Preparation

- Clean the oval measurement cell on the specific conductance sensor with a small, non-abrasive brush or cotton swab.
- Soap or rubbing alcohol may be used to remove grease, oil, or biological material.
- Rinse with water.

#### Calibration Standard

- Pour the specific conductance or salinity standard to within a centimeter of the top of the cup.
- Make sure there are no bubbles in the measurement cell of the specific conductance sensor.

#### Notes:

- TDS measurements are based on specific conductance and a user defined scale factor. For TDS calibrations, first calibrate specific conductance, then calibrate the Sonde with a site-specific scale factor. The factory default scale factor is 0.64 g/L / mS/cm.

### 3.4.5 Dissolved Oxygen %Saturation and mg/L

#### Cleaning and Preparation

- Remove the o-ring securing the DO membrane.
  - Shake out the old electrolyte.
  - Rinse with fresh DO electrolyte.
  - Refill with fresh DO electrolyte until there is a perceptible meniscus of electrolyte rising above the entire electrode surface of the sensor.
  - Make sure there are no bubbles in the electrolyte.
  - Hold one end of a new membrane against the body of the DO sensor with your thumb and with a smooth, firm motion, stretch the other end of the membrane over the sensor surface and hold it in place with your index finger.
  - Secure the membrane with the o-ring.
  - Make sure there are no wrinkles in the membrane or bubbles in the electrolyte.
  - Trim away the excess membrane extending below the o-ring.
- Ideally, let the sensor soak overnight to allow the membrane to relax to its final shape.

#### DO %Saturation Calibration Standard (Saturated-Air Method)

- Fill the Calibration Cup with deionized or tap water (specific conductance less than 0.5 mS/cm) until the water is just level with the o-ring used to secure the membrane.
- Carefully remove any water droplets from the membrane with the corner of a tissue.



- Turn the black calibration cup cover upside down (concave upward) and lay it over the top of the Calibration Cup.
- Determine the barometric pressure for entry as the calibration standard. See Section 4.1.3 for computation details on barometric pressure.

## Notes:

- Calibration of DO %Saturation also calibrates DO mg/L.

## DO mg/L Calibration Standard (Known Concentration Method)

- Immerse the sensor in a water bath for which the DO concentration in mg/L is known (for instance by Winkler titration). This calibration method is more difficult to perform than the saturated-air method.
- Make sure the circulator is turned on.
- Determine the barometric pressure for entry as the calibration standard. See Section 4.1.3 for computation details on barometric pressure.

## Notes:

- Calibration of DO mg/L also calibrates DO% Saturation.
- Note that if there is a change in barometric pressure after calibration (for instance, if barometric pressure drops as you move the calibrated Sonde to a higher elevation for deployment), the readings for DO %Saturation will not be correct. You must enter a new barometric pressure. However, the readings for DO mg/L will be correct regardless of changes in barometric pressure.

- we check against  
0 mg/L DO  
standard but  
do not  
calibrate  
after discussion  
w/ manufacturer

## 3.4.6 pH and ORP (Redox)

### Cleaning and Preparation of pH

- If the pH sensor is obviously coated with oil, sediment, or biological growth, clean the glass with a very clean, soft, non-scratching cloth wet with rubbing alcohol (a cotton ball will do).
- Rinse with tap water.

### Cleaning and Preparation of ORP

- If the platinum band at the tip of the ORP sensor gets dirty and/or discolored, polish it with a clean cloth and a very mild abrasive, such as toothpaste; or use a fine polishing strip.
- Rinse with water.
- Soak the sensor overnight in tap water to allow the platinum surface to restabilize.

### Cleaning and Preparation of Reference

- Gently pull the entire reference sleeve away from the Sonde. The reference sleeve is the clear blue tube with a Teflon Reference Junction attached.
- Discard the old electrolyte from the reference sleeve.
- Drop two KCl salt pellets (#0053756) or two KCl salt rings (#005309) into the reference sleeve.
- Refill the sleeve to the top with reference electrolyte.

## 6. Calibrate

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All of the sensors, except temperature, require periodic calibration to assure high performance. You will find specific calibration procedures for all sensors that require calibration in the following sections. If a sensor listed is not installed in your probe module, skip that section and proceed to the next sensor until the calibration is complete.



**CAUTION:** Reagents that are used to calibrate and check this instrument may be hazardous to your health. Take a moment to review *Appendix D Health and Safety*. Some calibration standard solutions may require special handling.

### 6.1 Getting Ready to Calibrate

#### 6.1.1 Containers Needed to Calibrate the Probe Module

The transport/calibration cup that comes with your probe module serves as a calibration chamber for all calibrations and minimizes the volume of calibration reagents required.

Instead of the transport/calibration cup, you may use laboratory glassware to perform calibrations. If you do not use the transport/calibration cup that is designed for the probe module, you are cautioned to do the following:

- ... Perform all calibrations with the Probe Sensor Guard installed. This protects the sensors from possible physical damage.
- ... Use a ring stand and clamp to secure the probe module body to prevent the module from falling over. Most laboratory glassware has convex bottoms.
- ... Ensure that all sensors are immersed in calibration solutions. Many of the calibrations factor in readings from other sensors (e.g., temperature sensor). The top vent hole of the conductivity sensor must also be immersed during some calibrations.



**6.1.2 Calibration Tips**

1. If you use the Transport/Calibration Cup for dissolved oxygen (DO) calibration, make certain to loosen the seal to allow pressure equilibration before calibration. The DO calibration is a water-saturated air calibration.
2. The key to successful calibration is to ensure that the sensors are completely submersed when calibration values are entered. Use recommended volumes when performing calibrations.
3. For maximum accuracy, use a small amount of previously used calibration solution to pre-rinse the probe module. You may wish to save old calibration standards for this purpose.
4. Fill a bucket with ambient temperature water to rinse the probe module between calibration solutions.
5. Have several clean, absorbent paper towels or cotton cloths available to dry the probe module between rinses and calibration solutions. Shake the excess rinse water off of the probe module, especially when the probe sensor guard is installed. Dry off the outside of the probe module and probe sensor guard. Making sure that the probe module is dry reduces carry-over contamination of calibrator solutions and increases the accuracy of the calibration.
6. If you are using laboratory glassware for calibration, you do not need to remove the probe sensor guard to rinse and dry the sensors between calibration solutions. The inaccuracy resulting from simply rinsing the sensor compartment and drying the outside of the guard is minimal.
7. If you are using laboratory glassware, remove the stainless steel weight from the bottom of the probe sensor guard by turning the weight counterclockwise. When the weight is removed, the calibration solutions have access to the sensors without displacing a lot of fluid. This also reduces the amount of liquid that is carried between calibrations.
8. Make certain that port plugs are installed in all ports where sensors are not installed. It is extremely important to keep these electrical connectors dry.

**6.1.3 Recommended Volumes**

Follow these instructions to use the transport/calibration cup for calibration procedures.

- Ensure that an o-ring is installed in the o-ring groove of the transport/calibration cup bottom cap, and that the bottom cap is securely tightened.

**NOTE:** Do not over-tighten as this could cause damage to the threaded portions.

- Remove the probe sensor guard, if it is installed.
- Remove the o-ring, if installed, from the probe module and inspect the installed o-ring on the probe module for obvious defects and, if necessary, replace it with the extra o-ring supplied.
- Some calibrations can be accomplished with the probe module upright or upside down. A separate clamp and stand, such as a ring stand, is required to support the probe module in the inverted position.
- To calibrate, follow the procedures in the next section, Calibration Procedures. The approximate volumes of the reagents are specified below for both the upright and upside down orientations.
- When using the Transport/Calibration Cup for dissolved oxygen % saturation calibration, make certain that the vessel is vented to the atmosphere by loosening the bottom cap or cup assembly and that approximately 1/8" of water is present in the cup.

Sensor to Calibrate	Upright	Upside Down
Conductivity	55ml	55ml
pH/ORP	30ml	60ml

**Table 6.1 Calibration Volumes**



## 6.2 Calibration Procedures

### 6.2.1 Accessing the Calibrate Screen

1. Press the **On/off** key to display the run screen.
2. Press the **Escape** key to display the main menu screen.
3. Use the arrow keys to highlight the **Calibrate** selection.

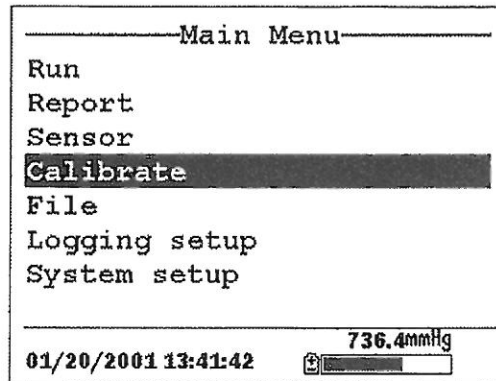


Figure 6.1 Main Menu

4. Press the **Enter** key. The Calibrate screen is displayed.

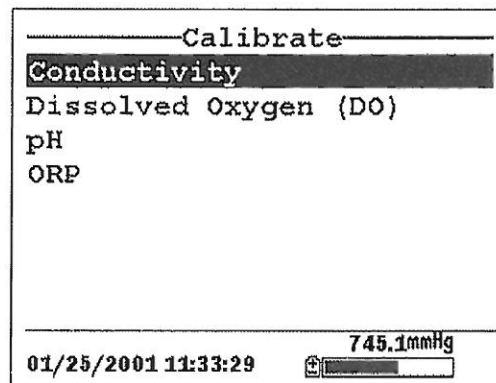


Figure 6.2 Calibrate Screen

### 6.2.2 Conductivity Calibration

This procedure calibrates specific conductance (recommended), conductivity and salinity. Calibrating any one option automatically calibrates the other two.

1. Go to the calibrate screen as described in Section 6.2.1 Accessing the Calibrate Screen.
2. Use the arrow keys to highlight the **Conductivity** selection. See Figure 6.2 Calibrate Screen.
3. Press **Enter**. The Conductivity Calibration Selection Screen is displayed.

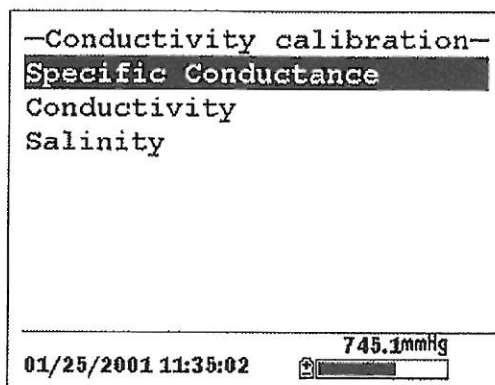
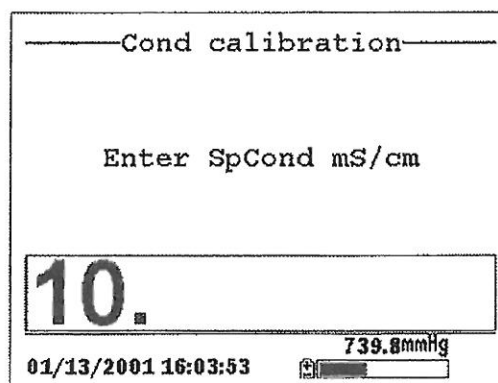


Figure 6.3 Conductivity Calibration Selection Screen

4. Use the arrow keys to highlight the Specific Conductance selection.
5. Press **Enter**. The Conductivity Calibration Entry Screen is displayed.





Cond calibration


Enter SpCond mS/cm

10.

01/13/2001 16:03:53 739.8mmHg

Figure 6.4 Conductivity Calibration Entry Screen

6. Place the correct amount of conductivity standard (see Table 6.1 Calibration Volumes) into a clean, dry or pre-rinsed transport/calibration cup.

 **WARNING:** Calibration reagents may be hazardous to your health. See *Appendix D Health and Safety* for more information.

**NOTE:** For maximum accuracy, the conductivity standard you choose should be within the same conductivity range as the samples you are preparing to measure. However, we do not recommend using standards less than 1 mS/cm. For example:

- For fresh water use a 1 mS/cm conductivity standard.
- For brackish water use a 10 mS/cm conductivity standard.
- For seawater use a 50 mS/cm conductivity standard.

**NOTE:** Before proceeding, ensure that the sensor is as dry as possible. Ideally, rinse the conductivity sensor with a small amount of standard that can be discarded. Be certain that you avoid cross-contamination of solutions. Make certain that there are no salt deposits around the oxygen and pH/ORP sensors, particularly if you are employing standards of low conductivity.

7. Carefully immerse the sensor end of the probe module into the solution.
8. Gently rotate and/or move the probe module up and down to remove any bubbles from the conductivity cell.

**NOTE:** The sensor must be completely immersed past its vent hole. Using the recommended volumes from Table 6.1 Calibration Volumes, should ensure that the vent hole is covered.

9. Screw the transport/calibration cup on the threaded end of the probe module and securely tighten.

**NOTE:** Do not overtighten as this could cause damage to the threaded portions.

10. Use the keypad to enter the calibration value of the standard you are using.

**NOTE:** Be sure to enter the value in **mS/cm at 25°C**.

11. Press **Enter**. The Conductivity Calibration Screen is displayed.

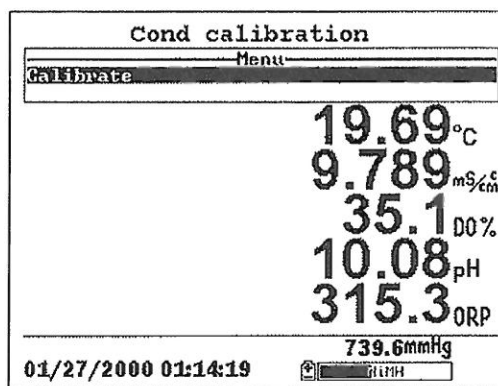


Figure 6.5 Conductivity Calibration Screen

12. Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors



will appear on the screen and will change with time as they stabilize.

13. Observe the reading under Specific Conductance. When the reading shows no significant change for approximately 30 seconds, press **Enter**. The screen will indicate that the calibration has been accepted and prompt you to press **Enter** again to Continue.

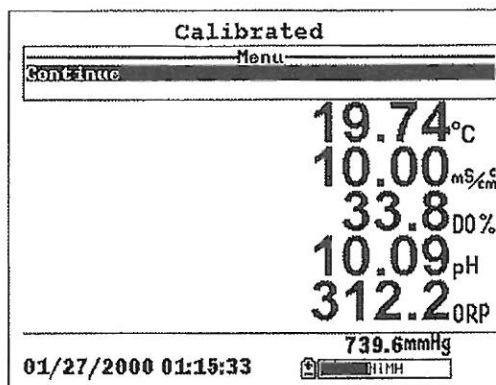


Figure 6.6 Calibrated

14. Press **Enter**. This returns you to the Conductivity Calibrate Selection Screen, See Figure 6.3 Conductivity Calibration Selection Screen.
15. Press **Escape** to return to the calibrate menu. See Figure 6.2 Calibrate Screen.
16. Rinse the probe module and sensors in tap or purified water and dry.

### 6.2.3 Dissolved Oxygen Calibration

This procedure calibrates dissolved oxygen. Calibrating any one option (% or mg/L) automatically calibrates the other.

1. Go to the calibrate screen as described in Section 6.2.1 *Accessing the Calibrate Screen*.

**NOTE:** The instrument must be on for at least 20 minutes to polarize the DO sensor before calibrating.

2. Use the arrow keys to highlight the **Dissolved Oxygen** selection. See Figure 6.2 Calibrate Screen.
3. Press **Enter**. The dissolved oxygen calibration screen is displayed.

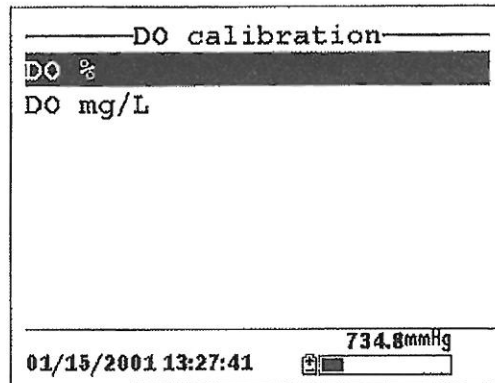


Figure 6.7 DO Calibration Screen

#### DO Calibration in % Saturation

1. Use the arrow keys to highlight the DO% selection.
2. Press **Enter**. The DO Barometric Pressure Entry Screen is displayed.

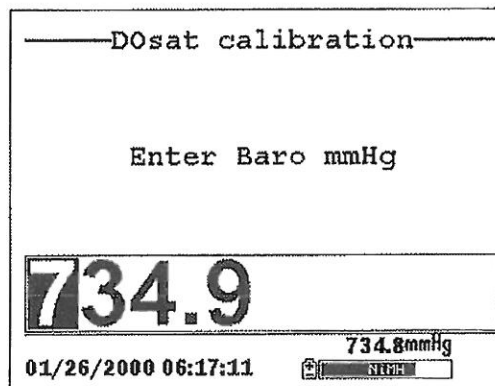


Figure 6.8 DO Barometric Pressure Entry Screen



3. Place approximately 3 mm (1/8 inch) of water in the bottom of the transport/calibration cup.
4. Place the probe module into the transport/calibration cup.

**NOTE:** Make sure that the DO and temperature sensors are **not** immersed in the water.

5. Engage only 1 or 2 threads of the transport/calibration cup to ensure the DO sensor is vented to the atmosphere.
6. Use the keypad to enter the current local barometric pressure.

**NOTE:** If the unit has the optional barometer, no entry is required.

**NOTE:** Barometer readings that appear in meteorological reports are generally corrected to sea level and must be uncorrected before use (refer to Section 10.10 *Calibrate Barometer, Step 2*).

7. Press **Enter**. The DO% saturation calibration screen is displayed.

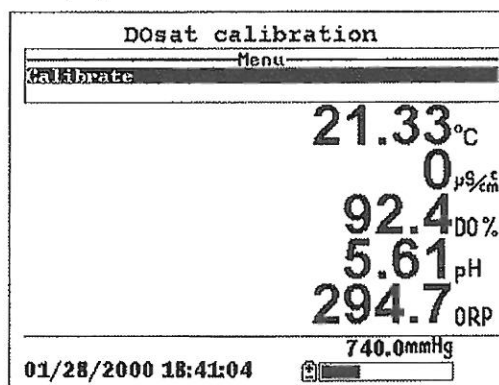


Figure 6.9 DO Sat Calibration Screen

8. Allow approximately ten minutes for the air in the transport/calibration cup to become water saturated and for

the temperature to equilibrate before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.

9. Observe the reading under DO %. When the reading shows no significant change for approximately 30 seconds, press **Enter**. The screen will indicate that the calibration has been accepted and prompt you to press **Enter** again to Continue. See Figure 6.6 Calibrated.
10. Press **Enter**. This returns you to the DO calibration screen, See Figure 6.7 DO Calibration Screen.
11. Press **Escape** to return to the calibrate menu. See Figure 6.2 Calibrate Screen.
12. Rinse the probe module and sensors in tap or purified water and dry.

#### DO Calibration in mg/L

DO calibration in mg/L is carried out in a water sample which has a known concentration of dissolved oxygen (usually determined by a Winkler titration).

1. Go to the DO calibrate screen as described in Section 6.2.3 *Dissolved Oxygen Calibration*, steps 1 through 3.
2. Use the arrow keys to highlight the **DO mg/L** selection.
3. Press **Enter**. The DO mg/L Entry Screen is displayed.

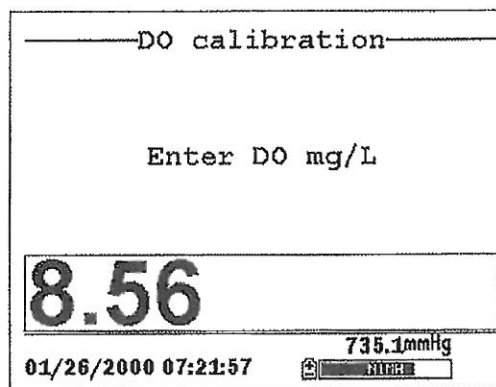


Figure 6.10 DO mg/L Entry Screen

4. Place the probe module in water with a known DO concentration.

**NOTE:** Be sure to completely immerse all the sensors.

5. Use the keypad to enter the known DO concentration of the water.
6. Press **Enter**. The Dissolved Oxygen mg/L Calibration Screen is displayed.

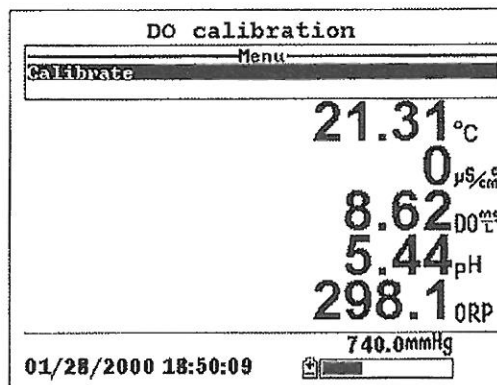


Figure 6.11 DO mg/L Calibration Screen



7. Stir the water with a stir bar, or by rapidly moving the probe module, to provide fresh sample to the DO sensor.
8. Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.
9. Observe the DO mg/L reading, when the reading is stable (shows no significant change for approximately 30 seconds), press **Enter**. The screen will indicate that the calibration has been accepted and prompt you to press **Enter** again to Continue.
10. Press **Enter**. This returns you to the DO calibration screen. See Figure 6.7 DO Calibration Screen.
11. Press **Escape** to return to the calibrate menu. See Figure 6.2 Calibrate Screen.
12. Rinse the probe module and sensors in tap or purified water and dry.

#### 6.2.4 pH Calibration

1. Go to the calibrate screen as described in *Section 6.2.1 Accessing the Calibrate Screen*.
2. Use the arrow keys to highlight the **pH** selection. See Figure 6.2 Calibrate Screen.
3. Press **Enter**. The pH calibration screen is displayed.